



# Impact of Ligado's Proposal on SATCOM, Aviation and Weather Data Users

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# Overview of the Impact of Ligado's Proposal



FCC rules allow for holders of mobile satellite service (MSS) spectrum to include an “*ancillary*” terrestrial component as part of their service, provided that the service is ancillary and does not cause harmful interference to existing MSS providers



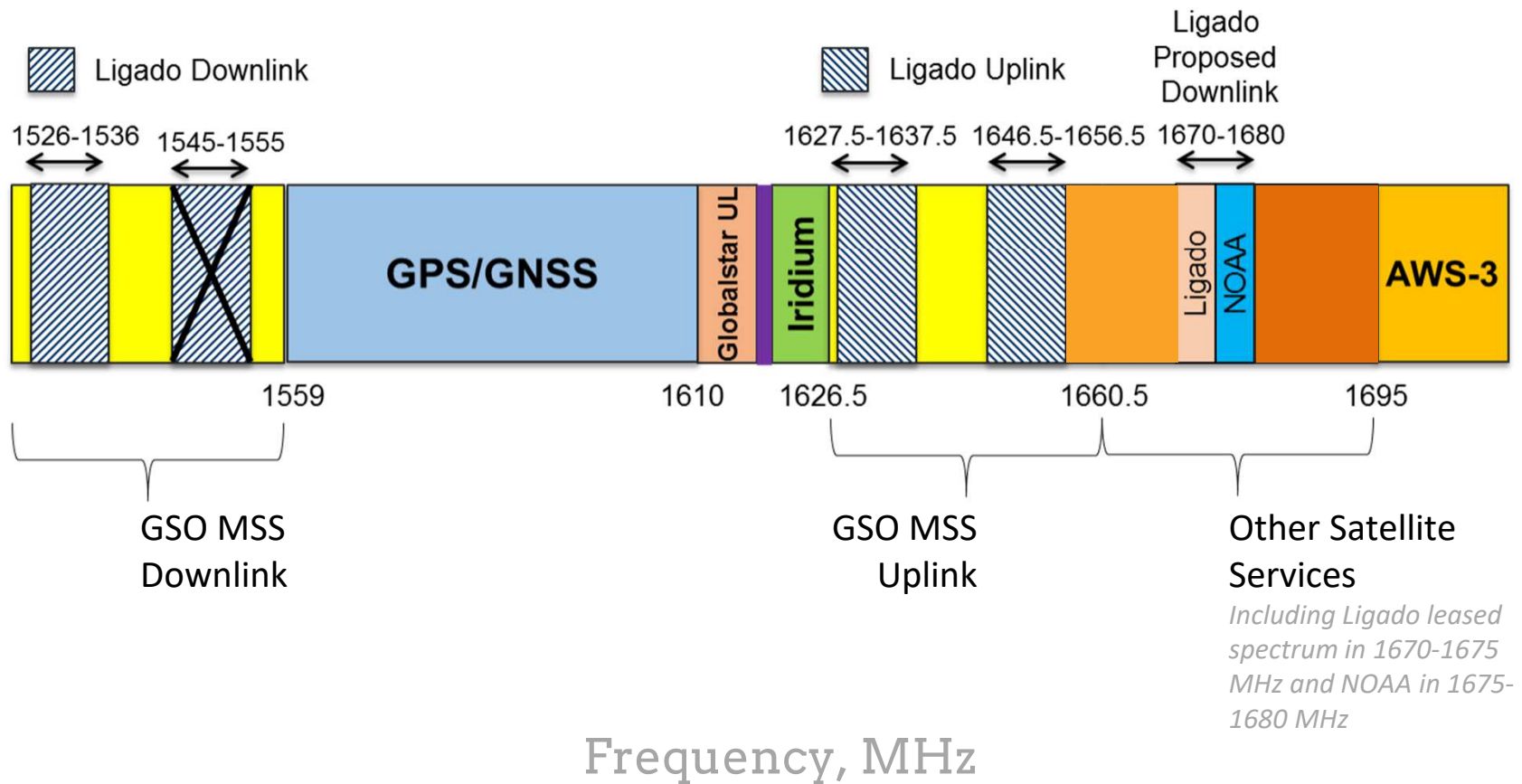
After emerging from bankruptcy, in December 2015 Ligado Networks (formerly LightSquared) applied to the FCC to operate a modified ancillary terrestrial network operating in the L-band (used by GPS, SATCOM providers, and weather/environmental data community)



Despite its press push, there remain significant concerns over harmful interference from Ligado's proposal from multiple parties:

- GPS will be heavily impacted by Ligado's plans, creating safety issues for aviation, and interference to many other types of GPS systems
- Ligado's proposed network will have potentially millions of mobile devices transmitting just 1 MHz away from critical SATCOM services, including cockpit communications
- Real-time weather satellite data from NOAA will face interference if Ligado is approved to operate in 1675-1680 MHz, degrading data relayed in real time via satellite from stream gauges for flooding, fire sensors for wildfire management, and tide gauges for coastal evacuations in hurricanes

# L-Band Neighborhood



# Impact to GPS Usage

- Ligado is planning **10,000+** sites that would interfere with certified aviation GPS when aircraft are operating in close proximity
  - "The concerns and safety issues of the industry have NOT been addressed, particularly when considering the lack of testing in key areas"
    - Letter from Eleven Aviation Organizations to FAA Acting Administrator Elwell, June 2018
- GPS interference is a safety of flight issue for low-level aircraft operators
  - Threat to medivac, state and local emergency aviation operations
  - GPS is a key sensor system for the Terrain Awareness and Warning System (TAWS)
  - Ligado yet to fully explain all necessary control measures
- Possible greater impact to other GPS operations
  - DOT Adjacent Band Compatibility study reported that high-precision GPS are more vulnerable than certified aviation receivers



We believe there are further serious concerns about the impact of Ligado's proposed operations on special, and scientific users of GPS that should be fully explored, such as:

- Unmanned Aerial Vehicles (UAVs) • Weather data and forecast • Space-based receivers

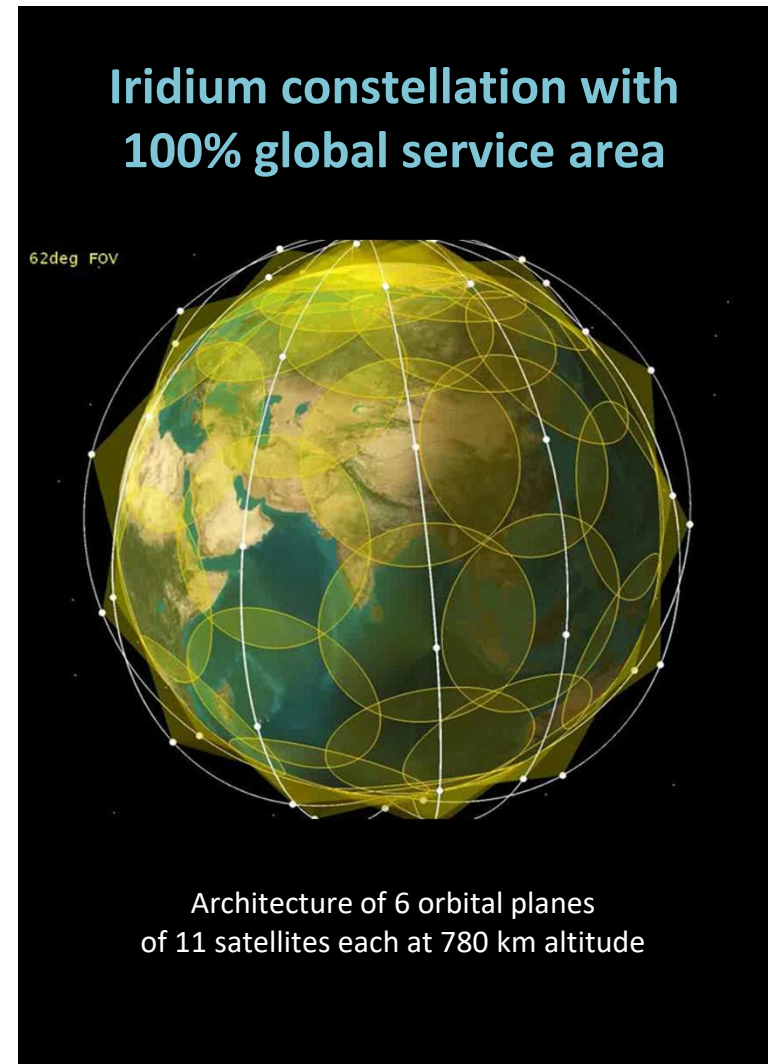
This risk is far too great ... for Ligado's proposal to be approved. While there are many broadband alternatives (Ligado would be a very small percentage of this national asset), there is only one GPS.



- PNT Advisory Board August 2018 Letter to PNT ExCom

# SatCom: A New Era for Global Connectivity

- On **January 11, 2019**, a flight-proven SpaceX Falcon 9 rocket launched from Vandenberg Air Force Base and delivered the final 10 Iridium® NEXT satellites to low earth orbit (LEO)
- This is the ***largest satellite constellation replacement ever***
- 66 cross-linked, low earth orbit (LEO) satellites
- Only ***fully global*** voice and data provider; approximately 1,213,000 subscribers
- Efficient operations using only 8.725 MHz of spectrum worldwide for uplink and downlink
- Messages are routed from satellite to satellite and grounded at teleports around the world





# SatCom: Harmful Interference to Iridium Services

- Ligado seeks to operate a modified ancillary terrestrial network operating in the L-band, including the 10 MHz adjacent to Iridium at 1627.5-1637.5 MHz
- Iridium's technical analysis (submitted to FCC on Sept. 1, 2016) and aviation-specific technical analysis (submitted to FCC on Dec. 14, 2016) indicates that this terrestrial operation on that 10 MHz of spectrum would result in significant harmful interference to Iridium's mobile terminals, including those used for vital SATCOM aviation services
- Section 25.255 of the FCC's rules requires Ligado to resolve any harmful interference from their terrestrial operations; purpose of the rule is clear – maximize flexibility consistent with sound spectrum management while providing absolute interference protection for incumbent MSS providers

# SatCom: Interference to air traffic control

- Interference to SATCOM exists for critical air traffic control and other safety-of-life communications used by the commercial and general aviation industry with the Inmarsat MSS network
- In 2016, Ligado acknowledged the potential interference to SATCOM transceivers installed on thousands of in-service aircraft, and indicated it would collaborate with Inmarsat and others to resolve these issues
- Interference from Ligado's network could likely be avoided through the installation of a new Diplexer/Low Noise Amplifier (DLNA) in each aircraft
  - The retrofit process would be time-consuming, costly and require extensive efforts to secure Type Certifications from the FAA
  - Compensation would be required to cover the significant installation costs for aircraft servicing centers and lost opportunity costs for aircraft owners
- Ligado now disclaims any obligation to ensure the retrofit process is funded and completed, and states that the dispute is a disagreement between a vendor and its customers and does not involve Ligado
- Ensuring the reliability of aviation safety communications is a fundamental public interest obligation of the Commission

# Broad Opposition to Ligado Proposal

“The [coalition] continues to have **serious unresolved concerns with Ligado’s proposed operations** ... The existing services provided by the GPS, SATCOM, aviation and real-time environmental satellite data communities, which depend upon interference-free operations in spectrum adjacent to or co-channel to spectrum central to Ligado’s plans, are too important to jeopardize, especially for the speculative benefits of Ligado’s constantly evolving proposals, details of which continue to be lacking.”

*July 18, 2018 ex parte letter  
Coalition of Aviation, SATCOM and Weather Information Users*

- *AccuWeather*
- *Aviation Spectrum Resources, Inc.*
- *Aerospace Industries Association*
- *DTN (formerly Schneider Electric)*
- *Aircraft Owners and Pilots Association*
- *General Aviation Manufacturers Association*
- *Airlines for America*
- *Gogo Business Aviation*
- *ALERT Users Group*
- *Helicopter Association International*
- *American Geophysical Union*
- *International Air Transport Association*
- *American Weather and Climate Industry Association*
- *Iridium Communications, Inc.*
- *American Meteorological Society*
- *Lockheed Martin*
- *Microcom Design, Inc.*
- *Rockwell Collins Inc.*
- *Narayan Strategy*
- *Satelles Inc.*
- *National Air Transportation Association*
- *National Hydrologic Warning Council*
- *National Weather Association*
- *Resilient Navigation & Timing Foundation*
- *National Emergency Number Association*
- *University of Wisconsin, Space Science and Engineering Center*



# Ligado is not 5G

- Ligado lacks sufficient contiguous spectrum for 4G, let alone 5G
- 5G network designers are contemplating channel widths of 100 megahertz for 5G applications
- Even if Ligado is able to cobble together 40 megahertz of spectrum across several different frequency bands, Ligado could at best offer 10 megahertz-wide channels
- The FCC's 5G FAST Plan does not consider Ligado or L-band spectrum as part of its 5G plans
- Most of the spectrum that Ligado would use for its "5G" network is allocated to satellite services. Ligado has been unable to show that its terrestrial operations will not interfere with satellite operations
- Ligado's spectrum is not part of the 3GPP standards for 5G, or any other recognized standard. Although it claimed that it would become part of the 3GPP standard in 2015, it still hasn't happened
- Ligado's spectrum is not harmonized regionally for terrestrial use

# The FCC Should Deny or Disregard Ligado's Section 7 Request

- Section 7 states:
  - “(a) It shall be the policy of the United States to encourage the provision of new technologies and services to the public...
  - (b) The Commission shall determine whether any new technology or service proposed in a petition or application is in the public interest within one year after such petition or application is filed...”
- Ligado's proposed operations do not qualify as “new technologies or services” under Section 7 – The M2Z decision squarely rejects Ligado's theory
  - *Applications for License and Authority to Operate in the 2155-2175 MHz Band*, Order, 22 FCC Rcd 16563 (2007), *affirmed* M2Z Networks, Inc. v. FCC, 558 F.3d 554 (D.C. Cir. 2009)
    - Providing 5G service alone cannot satisfy Section 7
    - Ligado is not proposing to offer 5G service
    - Ligado's proposed system is not otherwise a new technology or new service under Section 7
- Even if Section 7 applied in this instance, the provision's one-year shot clock only started ticking on June 25, 2019, the date of Ligado's Section 7 Request
- Even if Ligado were offering a new technology or service, it has not resolved longstanding public interest concerns with its proposed terrestrial network

# FCC Process

- 2001: Mobile Satellite Ventures (MSV), Ligado's predecessor, applies to provide a terrestrial and spot-beam satellite service and FCC starts rulemaking to adopt ATC rules
- 2003: FCC adopts *ATC Order* which sets rules for licensing and operation of ATCs
- 2004: MSV applies for ATC authority for cutting-edge GSM (*i.e.* '2G')
- 2008: MSV changes its name to SkyTerra and pursues "a network architecture using a choice of third generation ('3G') and fourth generation ('4G') wireless air interfaces"
- 2010: Harbinger obtains FCC approval to acquire control of SkyTerra (renamed LightSquared) with the goal of building a wholesale nationwide LTE network integrated with satellite coverage
- 2011: LightSquared applies for ATC authority and seeks multiple waivers of the ATC technical rules; FCC grants *Conditional Waiver Order* allowing terrestrial service if GPS concerns resolved
- 2011: LightSquared claims it will construct "a nationwide 4G network"
- February 2012: NTIA letter (with support from DOT and DOD) to FCC indicates GPS concerns cannot be resolved
- February 2012: In response to the NTIA letter, the FCC seeks comment on the NTIA letter regarding the LightSquared Conditional Waiver authorizations
- May 2012: LightSquared declares bankruptcy

# FCC Process, continued

- Late 2012-Mid 2013: LightSquared further amends its proposal
- November 2012: LightSquared files Petition for Rulemaking with the FCC to allow terrestrial mobile use in the 1675-1680 MHz band
- December 2015: LightSquared emerges from bankruptcy and rebrands as New LightSquared; New LightSquared files a new series of applications with the FCC seeking terrestrial flexibility to assist “in the 4G to 5G transition”
- February 2016: Company changes its name to Ligado Networks
- May 2016: Ligado states that it is “looking forward to a 5G future for the U.S. Wireless Industry”
- May 2018: Ligado incrementally amends its applications with the FCC
- August 2018: PNT AB recommends that PNT EXCOM oppose the Ligado proposal as amended in May 2018. The letter copies NTIA, NASA, the National Space Council, the FCC and the PNT National Coordination Office
- April 2019: FCC adopts NPRM proposing to reallocate spectrum in the 1675-1680 MHz band for shared use with terrestrial operations



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